

REMARKS

In the Official Action, the Examiner rejected claims 1-29 and objected to claims 25 and 29. In the present response, Applicants have amended claims 25 and 29 to address the Examiner's claim objections, and provided at least some of the distinctions between the references cited by the Examiner and the claimed subject matter. Accordingly, Applicants respectfully request reconsideration of the pending claims 1-29.

Interview Summary

In a telephonic interview on September 1, 2005, which was conducted with the undersigned, the prior art rejections and claimed subject matter were discussed with the Examiner. Applicants appreciate the Examiner's explanation and discussion of the rejections and cited references. Accordingly, in view of this consultation, Applicants have provided arguments for independent claims 1 and 18 to further clarify at least some of the distinctions of the claimed subject matter in view of the prior art.

Objection to Claims

In the Official Action, the Examiner objected to claims 25 and 29. In particular, the Examiner objected to claim 25 as being unclear, while claim 29 was objected to as referring to a step that is not performed. In this response, Applicants have amended claim 25, as suggested by the Examiner. This amendment is not believed to alter the scope of the original claim. With regard to claim 29, Applicants have amended claim 29 to replace "step (m)" with "step (l)." Again, this amendment is not believed to alter the scope of the original claim. Accordingly, Applicants respectfully request entry of these amendments.

First Rejection under 35 U.S.C. § 103

The Examiner rejected claims 1-12 under 35 U.S.C. § 103 (a) as being unpatentable over U.S. Patent No. 6,049,759 to Etgen, which is herein referred to as "Etgen," and U.S. Patent No. 4,679,174 to Gelfand, which is herein referred to as "Gelfand." Applicants respectfully traverse the rejection.

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (B.P.A.I. 1979). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination includes *all* of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). When prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988).

In the rejection of claims 1-12, the Examiner asserted that Etgen teaches all of the recited features except "optimizing the initial complete three-dimensional geologic model by perturbing the rock property values in at least one of the models according to specified geological criteria." *See* Official Action, page 5. In an attempt to cure this deficiency, the Examiner asserted that this feature is shown by the Gelfand reference. *See id.* However, the cited references, alone or in combination, fail to disclose "assigning values for at least one rock property in each initial frequency-passband model," as recited in claim 1. In addition, the cited references, alone or in combination, fail to disclose "optimizing the initial complete three-dimensional geologic model by perturbing the rock property values in at least one of the models

according to specified geological criteria," as recited in claim 1. Hence, the cited references cannot render the claimed subject matter obvious.

With regard to the first point, Etgen and Gelfand do not disclose "assigning values for at least one rock property in each initial frequency-passband model," as recited in claim 1. In the rejection, the Examiner relied on specific passages related to a velocity model and separate single frequency migrated volumes in the Etgen reference to disclose this claimed subject matter. However, these passages fail to disclose the claimed subject matter because the velocity model is not a frequency passband model and the separate single frequency migrated volumes are created from the velocity model.

For the cited passages associated with the velocity model, Etgen describes that a 3-D velocity model, which is described as a specification of the subsurface velocity structure as a function of depth for subsurface points located in the vicinity of the survey, may be written as a convolution of a migration operator with the seismic data. *See id.* at col. 3, lines 56-61; col. 5, lines 41-50. As an initial step to this process, the velocity model must be specified with each layer characterized. *See id.* at col. 5, lines 58-67. That is, assignments are made as part of the velocity model. Further, Etgen describes that an interpreter specifies rock properties for computations associated with the amplitude and travel time. *See* col. 17, lines 27-62. Clearly, because this velocity model is not a frequency-passband model, assigning rock properties to the velocity model does not disclose "assigning values for at least one rock property in each initial frequency-passband model," as recited in claim 1. As such, the cited passages associated with assigning rock properties in the velocity model do not disclosed the claimed subject matter.

Further, the passages associated with the single frequency migrated volumes do not disclose the claimed subject matter. In the cited passages, 3-D Fourier transform coefficients, which represent the seismic data, are derived from a discrete 3-D Fourier transform of the common offset data volume. *See id.* at col. 6, line 62 to col. 7, line 4. With the 3-D Fourier transform coefficients, separate single frequency migrated volumes are computed. *See id.* at col. 7, lines 5-32. However, it does not

appear from these passages that rock property values are assigned as part of the operations that create the single frequency migrated volumes. Indeed, as these single frequency migrated volumes are created from the velocity model, Etgen is not believed to suggest assigning rock properties once the separate single frequency migrated volumes are created. As such, Etgen does not disclose "assigning values for at least one rock property in each initial frequency-passband model," as recited in claim 1.

While the Examiner does not rely on Gelfand for these features, the Gelfand reference does not cure the deficiencies of Etgen. Gelfand describes a method of creating a two dimensional lithologic model within subsurface earth layers over an extended region. *See* Gelfand, col. 2, lines 46-49. In Gelfand, the model is constructed by converting a set of successive processed seismic reflection time-scale traces to a plurality of depth scale models in terms of the layer parameters. *See id.* at col. 2, lines 50-56. Then, a set of synthetic time-scale traces are computed and compared with the original traces. *See id.* at col. 2, lines 56-58. The parameters are then varied to match the synthetic time-scale traces with the original traces. *See id.* at col. 2, lines 58-67. Clearly, the method of Gelfand does not disclose or suggest generating a frequency-passband model, much less assigning values for rock property in frequency-passband models. As such, Gelfand does not disclose "assigning values for at least one rock property in each initial frequency-passband model," as recited in claim 1.

With regard to the second point, the references, alone or in combination, do not disclose or suggest "optimizing the initial complete three-dimensional geologic model by perturbing the rock property values in at least one of the models according to specified geological criteria," as recited in claim 1. As noted above, the Examiner acknowledges that Etgen does not disclose teach this claimed subject matter. Indeed, in Etgen, the individual single frequency migration volumes do not even appear to address rock properties. As such, Etgen does not disclose the claimed subject matter.

The Gelfand reference does not cure the deficiencies of Etgen. In relying on Gelfand, the Examiner cited to the abstract of Gelfand to disclose this recited feature.

See Official Action, Page 5. However, as noted by the Examiner, Gelfand simply teaches perturbing model-parameters in a two-dimension lithologic model. *See* Gelfand, Abstract. This passage does not disclose or teach optimizing a three-dimensional geologic model, much less optimizing the three-dimensional geologic model by perturbing rock property values in at least one frequency-passband model. As such, Gelfand does not disclose "optimizing the initial complete three-dimensional geologic model by perturbing the rock property values in at least one of the models according to specified geological criteria," as recited in claim 1.

Accordingly, in view of the remarks set forth above, Applicants respectfully submit that the Etgen and Gelfand references cannot support a *prima facie* case of obviousness. Therefore, Applicants respectfully request the Examiner's withdraw the rejection and allow the pending claims 1-12.

Second Rejection under 35 U.S.C. § 103

The Examiner rejected claims 13-25 and 27-29 under 35 U.S.C. § 103 (a) as being unpatentable over Etgen and Gelfand and U.S. Patent No. 5,838,634 to Jones et al., which is herein referred to as "Jones." Applicants respectfully traverse the rejection.

As a preliminary matter, in the rejection of claim 18, the Examiner does not cite any portion of the prior art as disclosing step (a) of the method. Thus, Applicants are unable to properly respond to such a rejection. Accordingly, if the rejection of this claim is maintained, Applicants respectfully request a non-Final Office Action to allow Applicants to properly respond to that rejection.

In the rejection of independent claim 18, the Examiner asserted that the Etgen and Gelfand teach all of the recited features except "combining the initial frequency-passband models to form an initial complete three-dimensional geologic model of said subsurface earth volume," "specifying training criteria for the initial complete geologic model," "calculating statistics that describe the characteristics of the assigned rock-property values in the complete geologic model," "calculating the initial objective function," "perturbing the rock-property values in the complete geologic

model so that the rock-property values more closely correspond to the training criteria," "calculating the objective function for the new tentative model," "retaining the perturbed rock-property values and the new tentative objective function if the objective function is reduced," "repeating steps (h) through (j) until the objective function is reduced to a specified limit" and "outputting the final complete geologic model to file." *See* Official Action, page 11. In an attempt to cure these deficiencies, the Examiner asserted that these features are shown by the Jones reference. However, the cited references, alone or in combination, fail to disclose all of the recited features. For instance, the references fail to disclose or suggest "assigning initial rock-property values to all model blocks in at least one initial frequency-passband model," as recited in claim 18. Hence, the cited references cannot render the claimed subject matter obvious.

Specifically, with regard to claims 18-25 and 27-29, the Etgen and Gelfand references do not disclose "assigning initial rock-property values to all model blocks in at least one initial frequency-passband model," as recited in claim 18. As noted above in the discussion of claim 1, Etgen describes a method for processing seismic data, while Gelfand describes a method of creating a two dimensional lithologic model. As the Examiner has again relied upon similar passages to those discussed above with regard to claim 1, Applicants reiterate that this claimed subject matter is not disclosed or taught for at least the reasons discussed above. Accordingly, the Etgen and Gelfand references do not disclose or teach "assigning initial rock-property values to all model blocks in at least one initial frequency-passband model," as recited in claim 18.

The Jones reference does not cure the deficiencies of Etgen and Gelfand. Jones describes a method of creating a three dimensional geologic model of the earth's subsurface. *See* Jones, col. 6, lines 47-52. In Jones, the process merges 3-D geologic modeling with forward seismic modeling to produce a model that consistent with geologic and geophysical principles. *See id.* at col. 6, lines 52-62. Then, the model perturbs the rock properties in the geologic model until the model is consistent with geologic and geophysical data and interpretations. *See id.* at col. 6, lines 62-67. Clearly, the method of Jones does not disclose or suggest a frequency-passband

model, much less, assigning rock-property values to blocks in the frequency-passband model. As such, Jones does not disclose "assigning initial rock-property values to all model blocks in at least one initial frequency-passband model," as recited in claim 18.

Furthermore, claims 13-17 depend from independent claim 1, and are believed to be patentable based on this dependence. In the rejection, the Examiner admitted that the Etgen and Gelfand references do not disclose or teach the subject matter of claims 13-17. In an attempt to cure the deficiencies, the Examiner relied on the Jones reference to cure deficiencies of Etgen and Gelfand. However, as discussed above with regard to claim 18, Jones does not cure the deficiencies of Etgen and Gelfand. As such, because Jones does not disclose the recited features of independent claim 1, the Jones reference fails to cure the deficiencies of Etgen and Gelfand for at least the reasons cited above.

Accordingly, in view of the remarks set forth above, Applicants respectfully submit that the Etgen, Gelfand and Jones references cannot support a *prima facie* case of obviousness. Therefore, Applicants respectfully request the Examiner's withdraw the rejection and allow the pending claims 13-25 and 27-29.

Third Rejection Under 35 U.S.C. § 103

The Examiner rejected claim 26 under 35 U.S.C. § 103(a) as being unpatentable over Etgen, Gelfand, Jones and applicant's own admission. Applicants respectfully traverse the rejection.

Claim 26 depends from independent claim 18, and is believed to be patentable based on this dependence. In the rejection, the Examiner relied upon a passage in the present application in an attempt to disclose certain subject matter, as obvious to one of ordinary skill in the art. However, the passage relied upon by the Examiner fails to cure the deficiencies of Etgen, Gelfand and Jones. In this passage, Applicants state that the rank-transform "method, known to persons skilled in the art of geologic modeling, resets the tentative cumulative frequency distribution of porosity calculated from the tentative geologic model to the desired cumulative frequency distribution of porosity." See Application, Page 22, section (b). This passage, which simply describes a known rank-

transform method, fails to suggest or teach "assigning initial rock-property values to all model blocks in at least one initial frequency-passband model," as recited in claim 18. As such, the passage fails to cure the deficiencies of Etgen, Gelfand and Jones.

Accordingly, because the references and the alleged admission fail to disclose *all* of the claimed elements, the references and the alleged admission fail to provide support for a *prima facie* case of obviousness. Therefore, claim 26 is believed to be patentable over the cited references, alone or in combination.

Conclusion

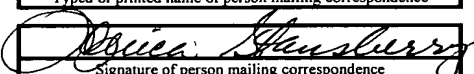
In view of the remarks and amendments set forth above, Applicants respectfully requests withdrawal of the Examiner's rejections and allowance of claims 1-29. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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Date

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